



DoD Microelectronics Commons

A National Network for Defense Microelectronics Innovation

Government-University-Industry Research Roundtable:

February 8, 2023

*Dr. Dev Shenoy,
PD Microelectronics, Director Defense
Microelectronics Cross Functional Team
OUSD (R&E) Microelectronics Modernization*

[HTTPS://WWW.CTO.MIL](https://www.cto.mil)



@DODCTO



@OUSDRE



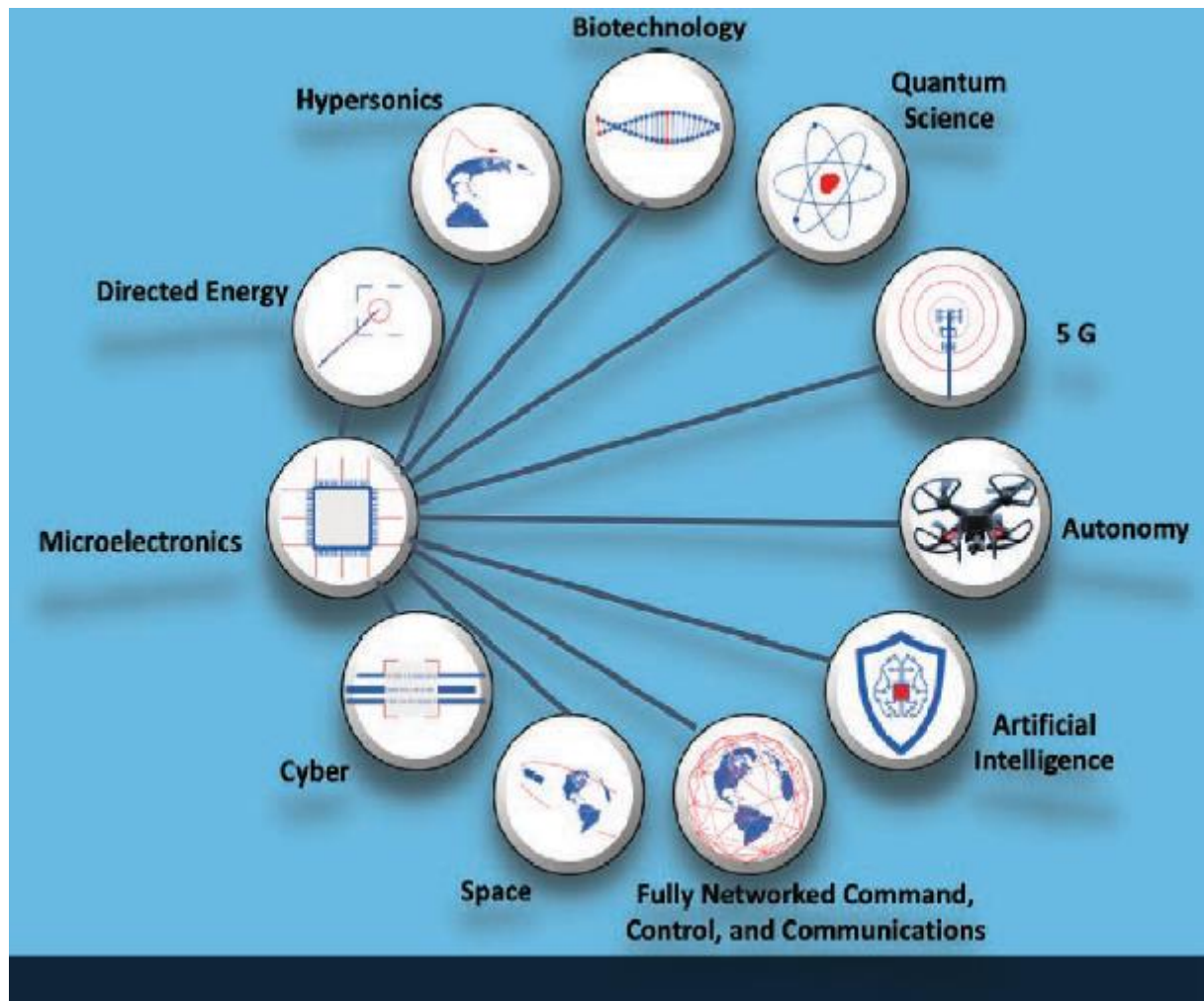
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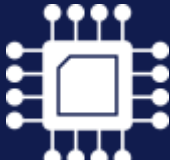
If there is any inconsistency between the material presented here and the Request for Solutions (RFS), **the RFS shall take precedence.**

The Microelectronics Commons RFS will be posted on www.sam.gov and <https://nstxl.org/opportunity/microelectronics-me-commons/>



CRITICAL TECHNOLOGY SYNERGIES: MICROELECTRONICS



-  **Autonomous Drones**
-  **AI Chips**
-  **Self Driving Vehicles**
-  **Energy Efficiency For Edge Computing**
-  **Military Applications**



Microelectronics a “must-win” technology for DoD

**BUILDING RESILIENT
SUPPLY CHAINS,
REVITALIZING AMERICAN
MANUFACTURING, AND
FOSTERING BROAD-BASED
GROWTH**

100-Day Reviews under
Executive Order 14017

June 2021

*A Report by
The White House*

*Including Reviews by
Department of Com
Department of Ener
Department of Defe
Department of Heal*

INTERIM NATIONAL SECURITY STRATEGIC GUIDANCE

MARCH 2021

PRESIDENT JOSEPH R. BIDEN, JR.

“Semiconductors are essential to national security. . . . They are fundamental to the operation of virtually every military system, including communications and navigations systems and complex weapons systems such as those found in the F-35 Joint Strike Fighter.”

“Semiconductors are key to the “must-win” technologies of the future, including artificial intelligence and 5G, which will be essential to achieving the goal of a “dynamic, inclusive and innovative national economy” identified as a critical American advantage in the March 2021 Interim National Security Strategic Guidance.

Fact Sheet: 2022 National Defense Strategy

Today, the Department of Defense transmitted to Congress the classified 2022 National Defense Strategy (NDS).

For the first time, the Department conducted its strategic reviews in a fully integrated way – incorporating the Nuclear Posture Review (NPR) and Missile Defense Review (MDR) in the NDS – ensuring tight linkages between our strategy and our resources. The unclassified NDS will be forthcoming.

Consistent with the President’s Interim National Security Strategic Guidance, the classified NDS sets out how the Department of Defense will contribute to advancing and safeguarding vital U.S. national interests – protecting the American people, expanding America’s prosperity, and realizing and defending our democratic values.

The Defense priorities are:

1. Defending the homeland, posed to the growing multi-domain threat posed by the PRC
2. Deterring strategic attacks against the United States, Allies, and partners
3. Deterring aggression, while being prepared to prevail in conflict when necessary, prioritizing the PRC challenge in the Indo-Pacific, then the Russia challenge in Europe
4. Building a resilient Joint Force and defense ecosystem.

The Department will act urgently to sustain and strengthen deterrence, with the People’s Republic of China (PRC) as our most consequential strategic competitor and the pacing challenge for the Department.

Russia poses acute threats, as illustrated by its brutal and unprovoked invasion of Ukraine. We will collaborate with our NATO Allies and partners to reinforce robust deterrence in the face of Russian aggression.

The Department will remain capable of managing other persistent threats, including those from North Korea, Iran, and violent extremist organizations.

Changes in global climate and other dangerous transboundary threats, including pandemics, are transforming the context in which the Department operates. We will adapt to these challenges, which increasingly place pressure on the Joint Force and the system that support it.

Recognizing growing kinetic and non-kinetic threats to the United States’ homeland from our strategic competitors, the Department will take necessary actions to increase resilience – our ability to withstand, fight through, and recover quickly from disruption.



DoD Addressing CHIPS Requirements for U.S. Microelectronics Ecosystem

Initiative	Topic	CHIPS Ref Language	CHIPS SEC.
Public Private Partnerships	- Partnerships to address DoD needs	- ensure development, production, acquisition, and sustainment of measurably secure microelectronics, - advancement of RF/OE and RADHARD technologies, - identification of work force and infrastructure resource requirements, designation of officials for maintenance of capabilities	- 9903. (a) 6A
NAS	- PPP Study	- Agreement with the National Academies of Science, Engineering, and Medicine to undertake a study to make recommendations and provide policy options for optimal public-private partnerships and partnership activities	- 9903. (a) 6C
ME Commons	- PPP for Lab-To-Fab onshore Prototyping	- enable the laboratory-to-fabrication transition of microelectronics innovations - global leadership in microelectronics of the United States - cost effective exploration of new materials, devices, and architectures, and prototyping - accelerate the transition of new technologies to domestic microelectronics manufacturers - accomplishing the purposes of the National Network for Microelectronics Research and Development	- 9903. (b) 1A - 9903. (b) 1B - 9903. (b) 2A - 9903. (b) 2B - 9903. (b) 2C



CHIPS Funded Study on Semiconductor Public-Private Partnership Models

Initiated: Congressionally Required NAS Study on 26 September

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Global Microelectronics: Models for the Department of Defense in Semiconductor Public-Private Partnerships

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This study will identify, explore, and assess public-private partnership models that have the potential to enable assured access for the production of semiconductors in the United States.

[Provide feedback on this project](#)

Description

Statement of Task: A National Academies of Sciences, Engineering, and Medicine-appointed ad hoc committee will identify, explore, and assess public-private partnership models that have the potential to enable assured access for the production of semiconductors in the United States. The committee will produce a consensus report that addresses the following questions.

DIVISIONS

[Division on Engineering and Physical Sciences](#)

[Policy and Global Affairs](#)

UNITS



Lab-to-Fab Transition of Microelectronics Technologies

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Research Universities, Start-ups have facilities for Lab prototyping but face barriers to demonstrating manufacturability in a Fab.

Core Facilities or Foundries/Fabs provide access to early stage Fab prototyping.

*Microelectronics Commons aims to enable lab-to-fab prototyping– evolve microelectronics laboratory prototyping to foundry/fab prototyping – in **domestic facilities**.*



The Microelectronics Commons: Innovation from Lab-to-Fab

Innovation Barriers

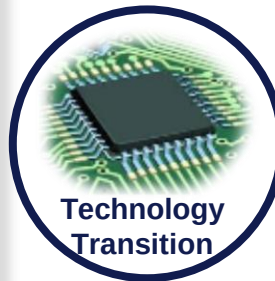
Lack of access to existing fabs for lab-to-fab prototyping

High capital costs for process and metrology tooling to support manufacturing of microelectronics technologies

High Intellectual Property (IP) and Electronic Design Automation (EDA) design license costs

Lack of domestic access to chip carriers, and packaging materials to support integration of electronics

Lack of workforce talent and expertise to support technology transition



End State

Sustained partnerships between emerging technology sources, manufacturing facilities, and interagency partners

Rapid transition of early-stage microelectronics research to proven technology in domestic foundries

Expand **domestic** microelectronics fabrication capability

Enhance microelectronics **education** to bolster the microelectronics engineering workforce

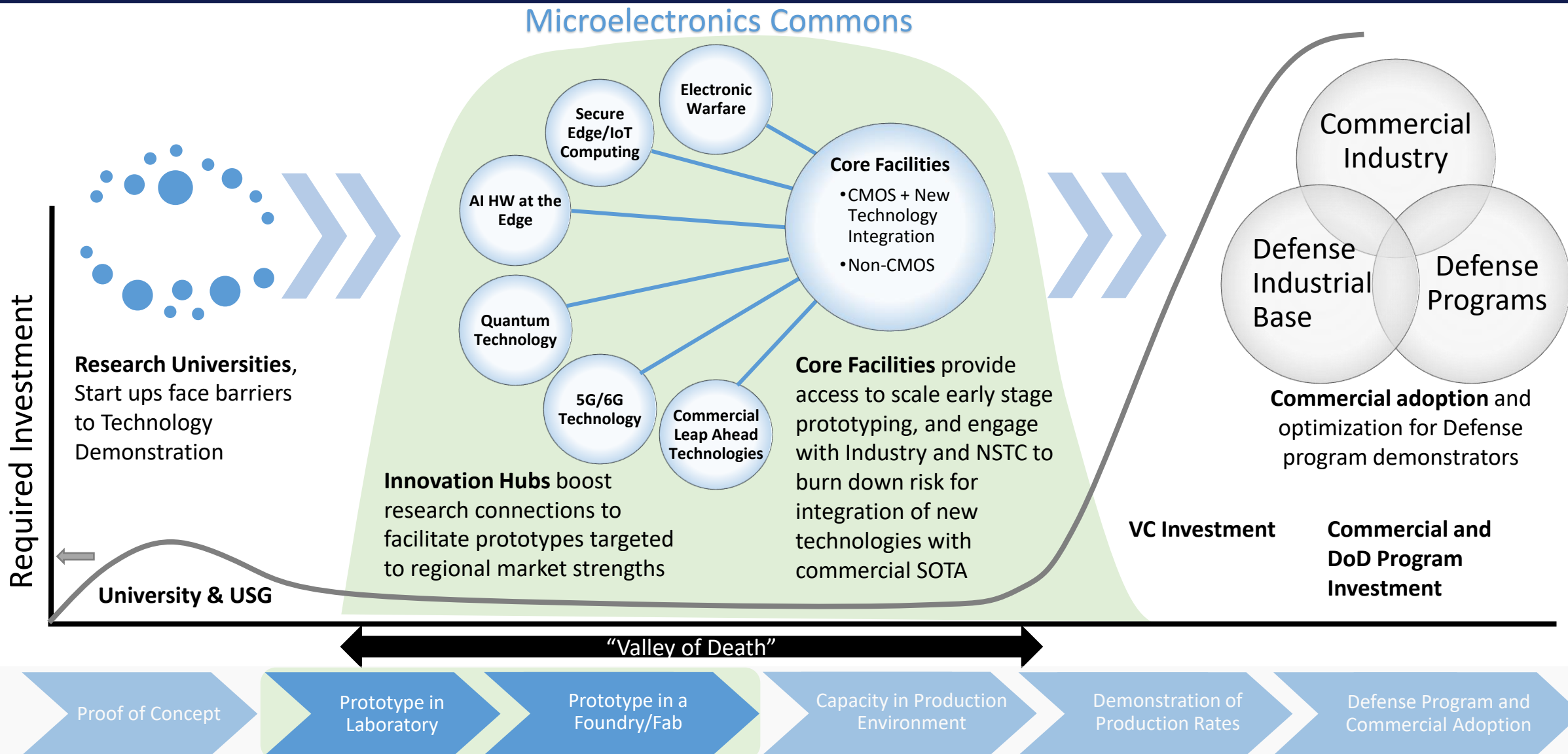
Develop a **pipeline of talent** to bolster local semiconductor economies and grow the domestic semiconductor workforce

Democratize access to capabilities needed for lab-to-fab prototyping



Microelectronics Commons Addresses the Valley of Death

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Progression from Concept to Product

S&T

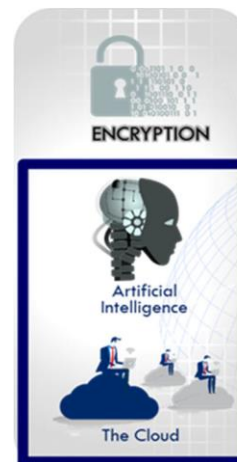
- Electronic Warfare
- Secure Edge/IoT Computing
- AI HW at the Edge
- Quantum Technology
- 5G/6G Technology
- Commercial Leap Ahead Technologies

Tech Demos

- RAMP
- RAMP-C
- SHIP
- T&AM Prototypes

Application Platforms

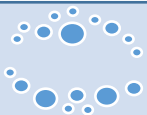
- Aircraft
- Submarines
- Ships
- Space Systems
- Ground Systems
- Missile Defense
- C4ISR



Lab-to-fab prototyping bridges valley of death from laboratory research to foundry/fab prototyping



Hubs and Cores



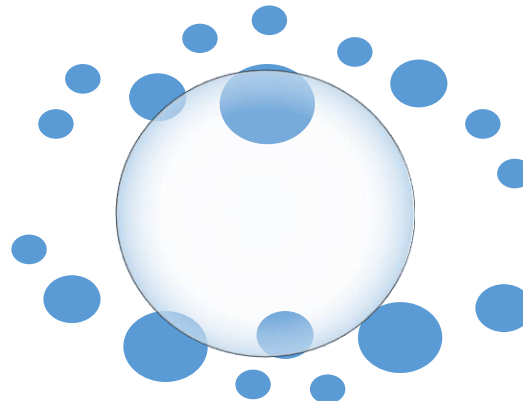
Hubs

A network of regional entities with lab prototyping capabilities and sources of microelectronics talent for onshore, lab-to-fab transition of semiconductor technologies while ensuring workforce training.

Hubs:

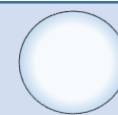
- Have the flexibility to bring in members from any region to be successful in their lab-to-fab efforts.
- Connect researchers and designers to prototyping capabilities targeted to strengths in the Hub's technical topic areas.
- Will be centers of expertise for one or more of the six critical technology areas.

Microelectronics Commons



Goal

To connect regional organizations through the Hub to accelerate lab-to-fab prototyping based on proximity and to strengthen local economies through a workforce that supports those regions.



Cores

Fabs/foundries that have scalable capacity beyond what the regional hubs can provide.

Cores serve to:

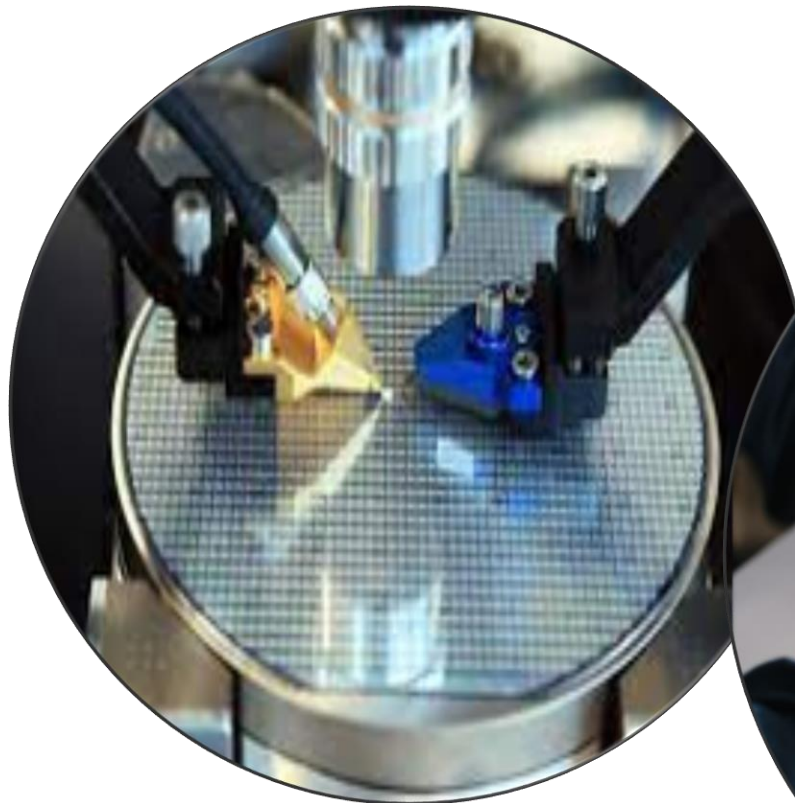
- Further complement and amplify the work of the regional hubs; for example, ≥ 200 mm wafer fab for Silicon CMOS-compatible technologies and ≥ 100 mm wafer fab for compound semiconductors.
- Engage with commercial fabs and align them better to commercial processes to facilitate transition to commercial and defense companies.
- Provide access to repeatable processes, back-end manufacturing/integration and full flow-fabrication.



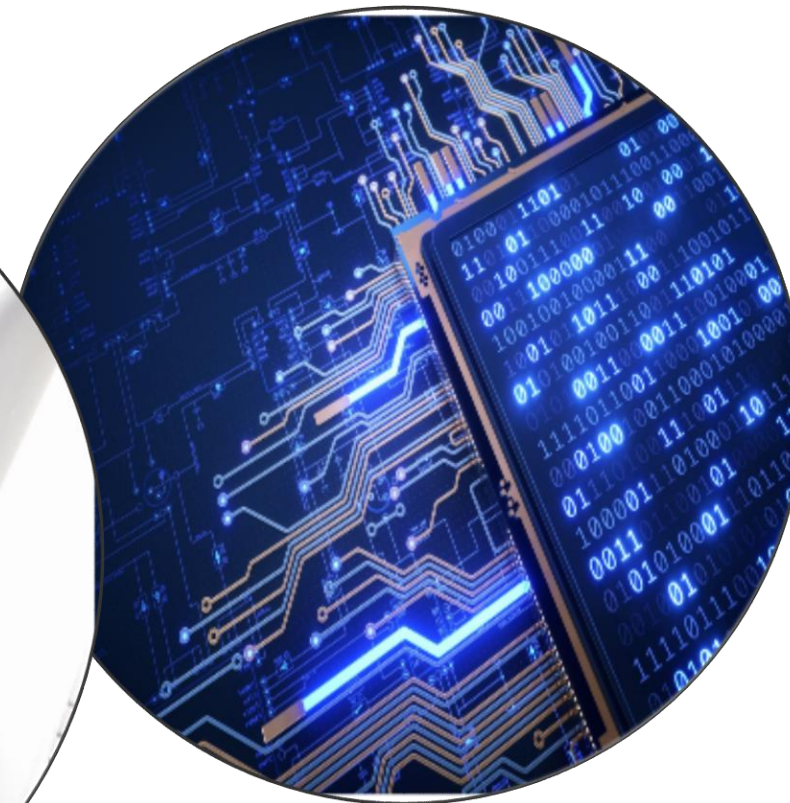
Commons Will Support Infrastructure

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Human Infrastructure



Physical Infrastructure



Digital Infrastructure ...

Infrastructure is foundational to the success of the Microelectronics Commons



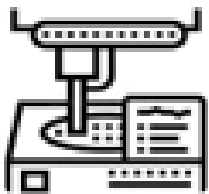
Role of Projects

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Support

Operational expenditures such as tooling maintenance and staff



Facilitate

Capacity increase of existing infrastructure through, for example, support for required staffing

Build

Additional infrastructure needed for successful prototyping as the Hubs mature



Develop



Talent and technologies in parallel

Challenge

Challenges incentivize the collaboration required for Cores to better align Hubs with commercial processes to facilitate transition of technologies.

This enables Hubs to better support the broader base of researchers and designers.

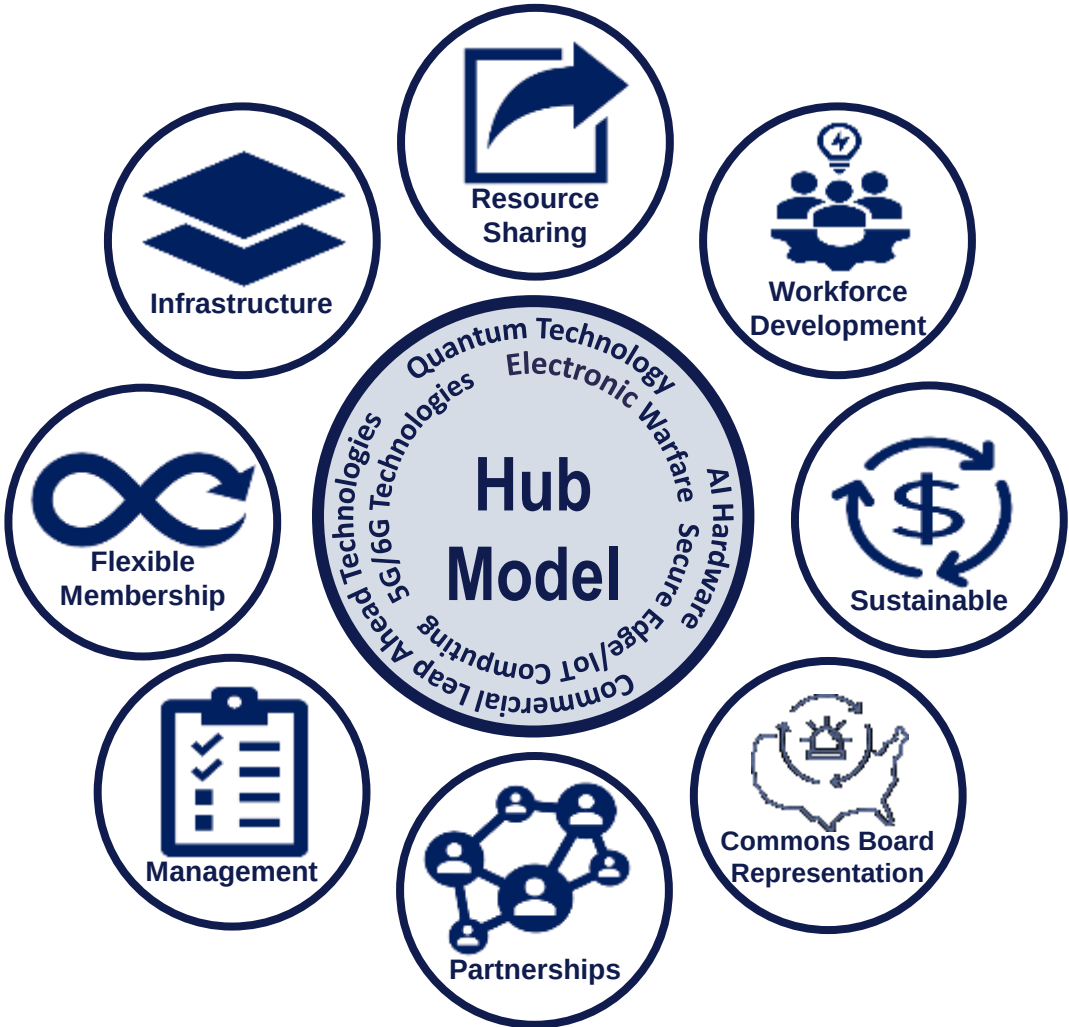


Projects enhance the value of infrastructure through staffing and utilization of lab and fab facilities



Hub Models

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Core Facilities positioned to engage with industry and Government to provide production capacity and commercialization

Hubs have the flexibility to develop a model that ensures participation from all interested stakeholders and sustains the hub in the long term



How to Submit your Questions

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The Naval Surface Warfare Center – Crane (NSWC Crane) Strategic & Spectrum Missions Advanced Resilient Trusted Systems ([S²MARTS](#)) Other Transaction Authority (OTA) will be the primary contract vehicle for the Microelectronics Commons

The Microelectronics Commons Consortium Manager, the National Security Technology Accelerator ([NSTXL](#)), will make program announcements (Events, Documentation changes, etc.) on the S²MARTS site and on www.sam.gov

Important Links

- Microelectronics – DoD Research & Engineering, OUSD(R&E) (cto.mil):
<https://www.cto.mil/ct/microelectronics/>
- Microelectronics Commons NSTXL: <https://nstxl.org/opportunity/microelectronics-me-commons/>
 - To submit any questions, locate “Submit a Question” on that site, complete the fields, and click “Submit”.